with chemical reagents under the microscope, the following reactions were observed:—On running in between the slide and cover-slip a solution of iodine in potassium iodide, a brown deposit was obtained. On running in concentrated nitric acid on another slide containing a drop or two of the secretion, a yellow coloration was formed, due to the formation of xantho-proteic acid. These two reactions show the presence of albumin in the secretion of the organ in question.

(*d.*) The soluble ferment secreted by the columnar cells of the epithelium of the gland was extracted according to the Wittich-Kistiakowsky method ('Pflüger, Archiv Physiol.,' vol. 9, pp. 438—459). The isolated ferment converts fibrin into leucin and tyrosin.

(*e.*) No glycocholic and taurocholic acids could be detected by the Pettenkofer and other tests. No glycogen was found in the organ or its secretion.

(*f.*) The secretion contains leucin and tyrosin.

From these investigations the conclusion to be drawn is that the so-called "liver" of *Patella vulgata* is similar in function to the pancreas of the vertebrate division of animal life.

XVII. "The Air of Sewers." By Professor CARNELLEY, D.Sc., and J. S. HALDANE, M.A., M.B., University College, Dundee. Communicated by Sir H. ROSCOE, F.R.S. Received May 21, 1887.

(Abstract).

Owing to the complaints which had been made of bad smells in the House of Commons a Select Committee was appointed in the spring of 1886 to inquire into the ventilation of the House. By that Committee the authors were instructed to make a series of analyses of the air in the sewers under the Houses of Parliament, and to report thereon. Since then they have examined a considerable number of sewers in Dundee, and have also made a number of laboratory experiments. The object of the research was to obtain a general idea of the amount of some of the more important impurities in sewer air, and to throw some light on their sources, and the conditions affecting their dissemination.

After giving a brief *résumé* of the results of the analyses which had been previously made of sewer air, the authors describe the methods they have employed, and the nature and condition of the sewers they have themselves examined.

As a result of their investigation they found—(1.) That the air of

the sewers examined was in a much better condition than might have been expected. (2.) That the carbonic acid was about twice, and the organic matter rather over three times as great as in outside air at the same time, whereas the number of micro-organisms was less. (3.) That in reference to the *quantity* of the three constituents named the air of the sewers was in a very much better condition than that of naturally ventilated schools, and that with the notable exception of organic matter it had likewise the advantage of mechanically ventilated schools (cf. paper by the authors and Dr. Anderson in 'Phil. Trans,' 1887). (4.) That the sewer air contained a much smaller number of micro-organisms than the air of any class of house, and that the carbonic acid was rather greater than in the air of houses of four rooms and upwards, but less than in two- and one-roomed houses. As regards organic matter, however, the sewer air was only slightly better than the air of one-roomed houses, and much worse than that of other classes of houses. (The data for all the classes of houses refer to sleeping rooms when occupied during the night.)

The amount of carbonic acid found by the authors was much less than that noted by earlier observers, showing that the sewers they examined were much better ventilated than those previously investigated.

On taking the average of a comparatively large number of analyses it was found that the quantity of organic matter in sewer air increased with the carbonic acid, whereas the micro-organisms on the whole decreased with increase of the other constituents.

With regard to the sources of the several impurities in sewer air the following conclusions are drawn :—(1.) The *carbonic acid* in excess of outside air may be partly due to diffusion from the neighbouring soil, but its chief source is probably the oxidation of the organic matter in the sewage and in the air of the sewer. (2.) The *organic matter* in excess of outside air is most probably wholly or for the most part gaseous, and is of course derived from the sewage itself. (3.) The *micro-organisms* in sewer air come entirely, or nearly so, from the outside, and are not derived, or only in relatively small numbers, from the sewer itself. This is proved by the following facts :—*First*, the average number of micro-organisms in sewer air was less than in outside air at the same time—viz., about 9 in the former to 16 in the latter. *Second*, the number increased with the efficiency of the ventilation. *Third*, the average proportion of moulds to bacteria in sewer air was almost exactly the same as in outside air at the same time, whereas one would expect the proportion to be very different were the outside air not the source from which they were derived, seeing that such a difference has been proved to exist in the air of houses, schools, &c. *Fourth*, the naked eye appearance of the colonies from sewer air is

similar to that of those from ordinary air. *Fifth*, the state of filthiness of a sewer seems to have no perceptible effect on the number of micro-organisms. *Sixth*, the view that the micro-organisms in sewer air chiefly come from outside, is in perfect agreement with what is known as to the distribution of bacteria in air. *Seventh*, results obtained in the laboratory with an experimental sewer prove that the micro-organisms present in air are diminished to nearly one-half in passing along a moist tube 5 feet long and $1\frac{3}{4}$ inch in diameter at a rate of nearly 1 foot per second. Although most of the micro-organisms in sewer air come from outside, yet there was distinct evidence of their occasional dissemination from the sewage itself. This is the case when splashing occurs, owing to drains entering the sewer at points high up in the roof. It is, therefore, of great importance that drains should be so arranged as to avoid splashing as much as possible.

In view of the fact that ordinary sewer air is to all appearance comparatively innocent as regards its micro-organisms, experiments were also made to see whether it contained any poisonous volatile base of the nature of a ptomaïne. These experiments so far as they went had negative results.

Experiments as to the efficacy of ordinary water traps in preventing the escape of sewer gas into houses confirmed and extended the results previously obtained by Fergus.

Though the authors do not discuss the effect of the inhalation of sewer air on health, yet the results of the above investigation are clearly such as to make one much more suspicious as to supposed evidence of the bad effects of ordinary sewer air (at least when not vitiated by splashing), such as that examined by them.

XVIII. "On the Composition of Water by Volume." By Alexander Scott, M.A., D.Sc. Communicated by Lord Rayleigh, D.C.L., Sec. R.S. Received May 23, 1887.

In 1805 Gay-Lussac and Humboldt published their classical researches on the composition of the atmosphere, and to them we are indebted for our knowledge of the proportion by volume in which hydrogen and oxygen combine to form water. Without this knowledge the determination of the relative densities of the two gases would be of no use in fixing or checking their atomic weights. This is often overlooked, and Avogadro's law taken as absolutely true for these gases at ordinary temperatures and pressures. That this cannot safely be assumed is conclusively proved by the researches of Regnault, Amagat, and others on the effects of change of temperature and pressure upon them. Not only do they not follow Boyle's law as usually